

Smith Island

Restoring Salmon Habitat Protecting Critical Infrastructure

APWA 2020 PROJECT OF THE YEAR

January 2020

Snohomish County Public Works

Division: \$25 Million–\$75 Million

Category: Environment



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Project Overview



The Smith Island Restoration project re-established historic tidal marshlands that provide critical habitat for threatened Chinook and other salmonid species. This project represents the second largest estuary restoration project in Puget Sound.

Snohomish County completed construction of the Smith Island Estuary Restoration project on November 30, 2018. The project reestablished tidal marsh conditions to more than 330 acres of the Snohomish River estuary, 30 miles northeast of Seattle, Washington. For more than two decades, multiple agencies worked together to positively impact the entire Puget Sound region. Restoration efforts benefit several endangered salmon species, including Chinook, Steelhead and Bull Trout. The project site is also an important stopover on the Pacific Flyway, a regional flight corridor for migratory birds that extends from Alaska to Mexico and South America.

Restoration highlights include:

- Construction of a 1.2 mile-long setback dike to protect adjacent agricultural properties, US Interstate-5 and the City of Everett Waste Water Treatment Plant;
- Protection of a Puget Sound Energy high pressure natural gas pipeline that serves tens of thousands of Western Washington customers;
- Reconnection of tidal flow to hundreds of floodplain acres to support fisheries and improve public access to water recreation, walking trails and wildlife viewing.

The Smith Island project has contributed more than 30 percent of the Snohomish estuary acreage restoration target established in the federally-adopted Chinook salmon recovery plan for the Snohomish Basin. This restored estuary habitat adds capacity to support hundreds of thousands of juvenile salmon making their way from upstream spawning areas out to the ocean each year.

Estuary habitat provides young salmon with food and shelter while they adapt to salt water. Restoring the historic estuary area creates the space and conditions salmon need to grow in size and strength ahead of their unique journey to the Pacific Ocean.

Highlights



Project Statistics

- \$20.8 million in state and federal grant funds awarded
- 4,510 feet of dike breached to restore tidal flow to 37 acres of estuary habitat
- 18,480 feet of tidal channels reconnected to allow fish access to rearing habitat for salmon
- 10,994 feet of new channel habitat created and 42 wood habitat features installed to improve rearing conditions
- 6,530 feet of new setback dike constructed to protect public and private infrastructure valued at \$80 million

Project Benefits:

- Restoring tidal influence to Smith Island supports up to 250,000 juvenile salmon every year
- Functioning floodplain generates \$4 - \$6 million annually in public benefits through:
 - Improved aesthetics and recreation opportunities
 - Enhanced climate and water regulation
 - Enriched aquatic habitat and water quality

Background

Location

The Snohomish Watershed is the second largest drainage into Puget Sound. This project is centrally located in the Snohomish River estuary, northeast of Everett, Washington (30 miles northeast of Seattle, Washington). Historically, site wetland conditions were characterized as the transition zone between estuarine marsh and forested riverine zones and a gateway between wild anadromous species' spawning and rearing habitats.

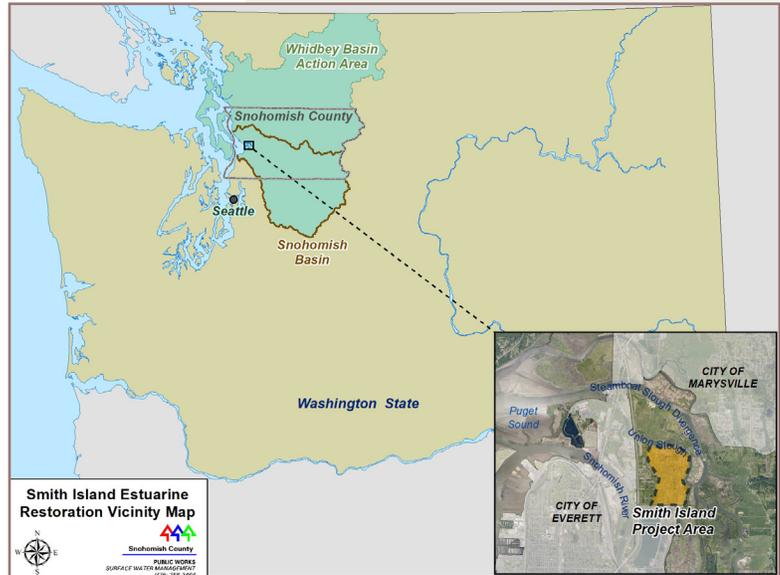
History

Beginning in the 1860's, early European settlers harvested timber, drained thousands of acres of tidal marsh, ditched tributaries, and constructed more than 44 miles of dikes throughout the Snohomish Estuary. Before then, the banks were naturally forested and meandering channels supported abundant fisheries.

The Snohomish Estuary historically encompassed 10,000 acres of tidal marsh. A century of diking, deforestation, and urbanization has disconnected 90 percent of estuary habitat from tidal influence; dramatically altering the functioning of the landscape. The Snohomish Estuary is estimated to have lost almost half of its juvenile Chinook salmon production capacity, largely due to estuarine habitat loss to development. (2001. Salmon Habitat Restoration Opportunities in the Snohomish River Valley, Washington. Snohomish County Public Works, Surface Water Management Division Report)

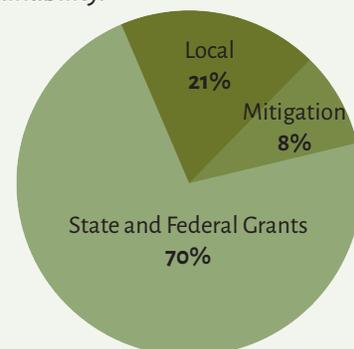
For 85 years, Smith Island remained disconnected from the historic floodplain by a dike and tide gates. In addition to diminished salmon habitat, disconnection from river and tidal influences has resulted in subsidence of interior soil elevations of up to eight feet in places.

A restoration project of this size and magnitude so close to critical infrastructure posed significant challenges. The successful protection and restoration of Snohomish River wetlands depended on hundreds of individuals, across many organizations united under a shared vision. Snohomish County and partners spent nearly 20 years and more than \$30 million dollars to see their vision realized.



Budget

Construction contracts totaled \$16.7 million. The project overall cost nearly \$30 million for site acquisition through construction. State and federal grants contributed 70 percent of overall costs (nearly \$21 million). Compensatory mitigation agreements contributed an additional \$2.5 million toward design and construction, and local sources funded \$6.3 million overall. In addition, the county invests more than \$300,000 annually towards dike and drainage operation and maintenance to ensure infrastructure sustainability.



Construction Management



Aerial of new drainage pond and setback dike



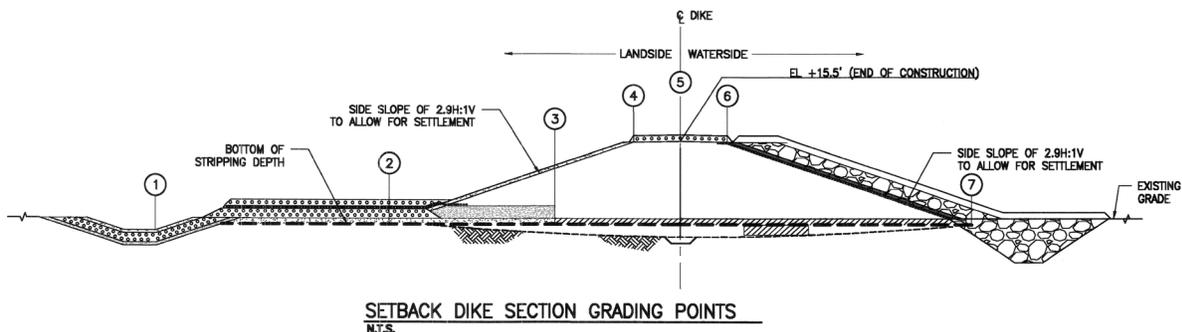
Drainage pond

PHASE 1
Protecting
\$80 million in
development

Construction occurred in two phases, over four construction seasons (2015 – 2018), with two contractors. Phasing had to accommodate two years of consolidation settlement, placing drain pipes in the levee after initial settlement, working in a tidal environment, weather delays, winter construction suspensions, and the permit dates for in-water work to protect aquatic life.

Phase 1 included construction of infrastructure to protect more than \$80 million in existing public and private development. Phase 2 initiated the restoration of tidal marsh conditions to support salmon population recovery.

Scarsella Brothers, Inc. undertook Phase 1, including construction of the 1.2 mile long, 15.5 foot tall setback dike. The dike was composed of approximately 330,000 tons of engineered fill material (13,200 truck loads). Access roads were installed along the top and landward side of the dike, and nearly 50,000 tons of rip rap armoring was placed to reinforce the dike's water side. A 9-acre stormwater pond was constructed on the landward side of the dike. The pond drains to the estuary at low tide via two 36 inch diameter gravity pipes. Tide gates allow low tide drainage and prevent high tide backwatering. A 1,460 gallon per minute pump station provides added flood protection with automated water level monitoring equipment to maintain specific pond elevations. The setback dike was built to exceed U.S. Army Corps of Engineers PL 84-99 program standards; engineered for long-lasting performance against settlement and erosion. Phase 1 was substantially completed in three construction seasons and the Scarsella Brothers, Inc. contract closed under the engineer's estimate of \$15.17 million.



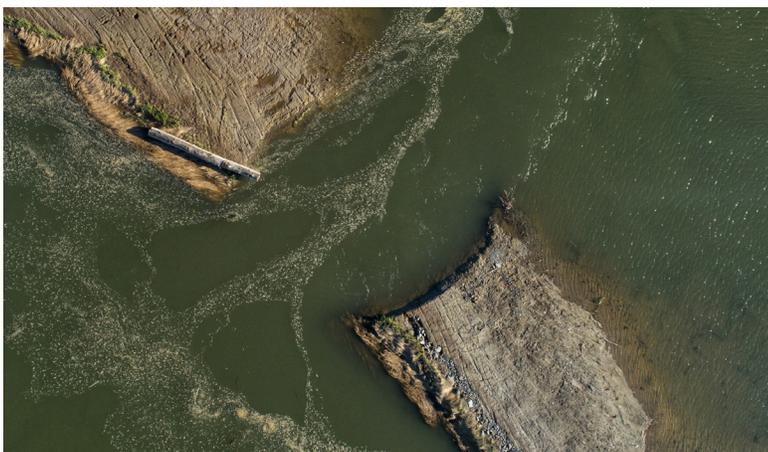
Phase 2 was completed by Orion Marine Contractors, Inc. over two construction seasons. Ahead of dike breach, interior work involved:

- Connection of 3-1/2 miles (18,480 feet) of tidal channels to provide young fish with calm, shallow places to forage and hide from predators while they mature;
- Installation of forty-two engineered wood structures, anchored with sisal rope rather than steel cables, to facilitate channel formation and capture floating wood debris. These structures provide cover for juvenile fish and cultivates micro-invertebrate “fish food.”

PHASE 2 Reestablishing tidal marsh conditions for salmon

Dike breach occurred during the 2018 in-water work window with the contractor reducing the remnant dike height to below high tide elevation and removing about 4,000 linear feet of dike to create two large breaches and 17 starter channel connections. Cost savings during construction reduced the contract by \$291,000; concluding Phase 2 well below the \$2.27 million engineer’s estimate.

Snohomish County Public Works Department managed construction, with contracted support from the design engineer, Otak, Inc. Snohomish County also partnered with the City of Everett to add an additional 47.5 acres of newly restored habitat that is hydraulically connected to the county project at high tide. Economies of scale achieved the maximum restoration footprint at the minimum cost.



Tidal inundation of the site



Breaching the old dike to connect a starter channel



Wood habitat feature placement

For the first time in 85 years, tidal flows have returned to more than 350 acres of historic tidal marshlands in the Snohomish River Estuary



Idling equipment during halted construction

Adapting to Circumstances

At the height of the summer 2018 construction season, the Operator's Union went on strike, halting remnant dike excavation right after it began and ahead of an event to mark this restoration accomplishment. Tidal inundation of the site for the first time in 85 years represented a significant regional milestone for Puget Sound recovery, with dozens of project partners from all levels of government coming together to celebrate project completion.

Equipment remained idle for over two weeks. There was great concern that in-water work may not be completed before close of the 2018 fish window on October 15th, which would have delayed completion of Phase 2 until the following summer.

Fortunately, Orion Marine negotiated an agreement with the Operators Union, enabling their crew to resume work before the strike ended. This enabled dike breach to proceed, and all in-water work to be completed before the end of the 2018 fish window.



Great Blue Heron visiting the site



Project managers, past and present, oversaw progress for two decades

Project Timeline

Construction of Phase 1 and 2 occurred between August 2015 and November 2018. Project planning began some 20 years earlier with the 1999 listing of Puget Sound Chinook as a threatened species. Following Chinook listing, Snohomish Estuary acquisitions for habitat restoration began in earnest. Between 2002 and 2007, the county acquired 415 acres on Smith Island. Design, permitting, and securing funds required eight years and successful navigation of multiple regulatory and funding barriers. Pre-construction highlights included:

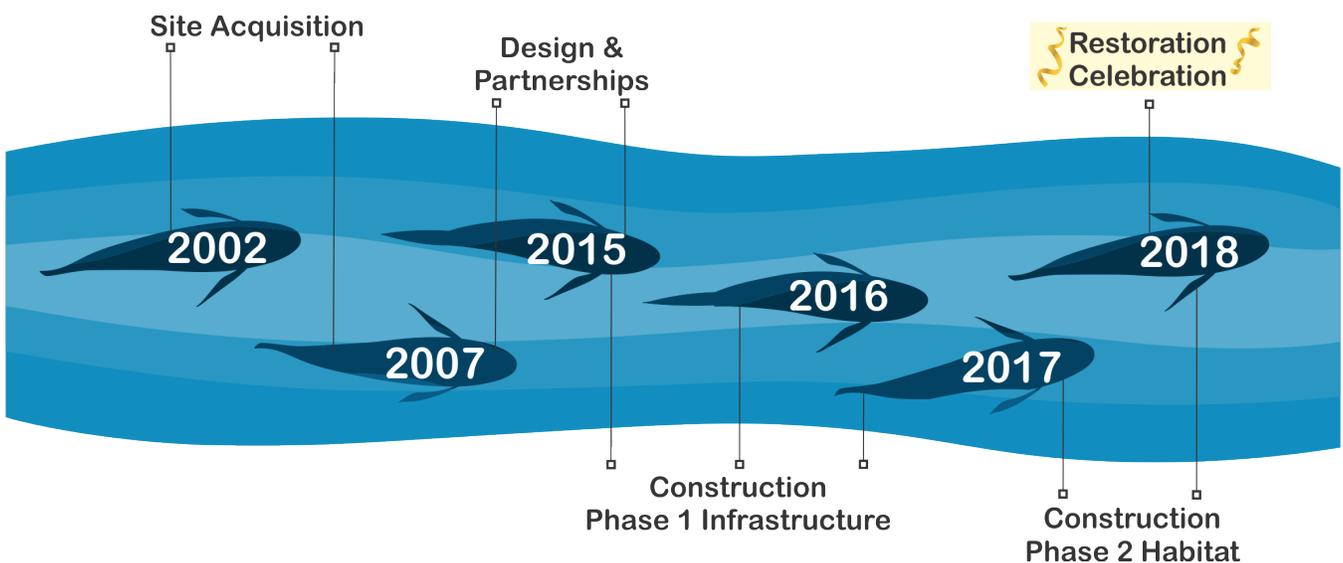
- Engineering challenges included gas pipeline protection and drainage system location and function;
- Stakeholder opposition to agricultural land conversion for salmon habitat restoration;
- Environmental Impact Statement process to assess changes to hydrology and drainage, saltwater intrusion, hydraulic conditions, and setback dike overtopping considerations; and
- Securing \$23.7 million from 22 grant and other funding agreements.



Chinook salmon fry in restored Smith Island



*Chinook are a key food source for local orcas
Photo: Dave Ellifrit*



Safety Performance

Constructed and natural flood protections safeguard public infrastructure and private property



Crews installing strain gauge equipment on gas line



Equipment placing rip rap armoring on new setback dike

Restoring wetland habitat adjacent to critical infrastructure presents many design challenges. Foremost of these was protecting the 16-inch Puget Sound Energy high pressure natural gas pipeline bisecting the site and setback dike. Strict specifications for setback levee material placement were utilized to manage bending stress on the pipeline under the new levee and strain gauges that monitored pipeline condition.

Also, soils across the Snohomish Estuary are contaminated with arsenic from circa-1900 smelter and other industrial operations. Throughout construction, an Industrial Hygiene Consultant monitored and advised on employee arsenic exposure, and multiple dust control measures were used to minimize airborne mobilization of particles. Because soil tests determined arsenic levels were below marine sediment standard regulations, all 85,000 cubic yards of soil excavated from the site were placed below the high water elevation to provide erosion protection for the pipeline. This saved time and expense of hauling those soils offsite for disposal. Another 60,000 cubic yards of remnant dike breach and channel excavation material was used to help rebuild the subsided marsh plane.

During Phase 1 and Phase 2, each contractor sent their safety officers to visit the site frequently and on-site teams conducted daily safety meetings. There were no lost time injuries or incidents during either phase of construction.



Installing 36" gravity drain pipe from pond to water side of setback dike

Environmental Considerations

Public Policy and Priorities

Floodplain and estuary areas of this fast growing county have competing interests surrounding farmland protection, salmon recovery, and flood management. Smith Island, and other large-scale estuary restoration projects, created feelings of mistrust, anger and fear amid regulatory friction, litigation, and gridlock for farms, flood control districts, and salmon habitat and water quality projects.

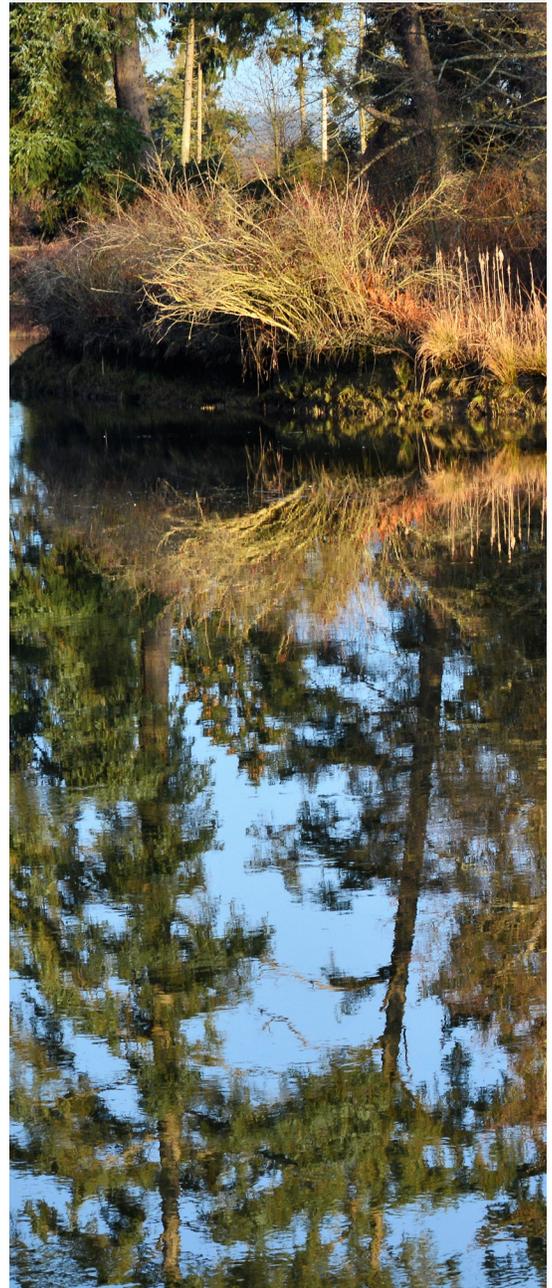
This land use controversy has persisted for more than half a century. In the late 1960's, local farmers favored flood control recommendations from the U.S. Army Corps of Engineers, including damming a tributary of the Snohomish River.

With a 1974 landmark environmental mediation agreement, endorsed by then Washington State Governor, Daniel J. Evans, the Snohomish Estuary was recognized as a significant environmental and cultural resource to be protected and preserved.

Since this time, state, local, and tribal jurisdictions have protected more than 4,300 acres (43 percent) of the Snohomish Estuary and restored fish access to more than 1,332 acres (17 percent). Snohomish County is a leader in recovery actions; protecting more than 1,740 estuary acres from development and having actively restored tidal flow to over 400 acres.

The Smith Island controversy galvanized local commitment to address longstanding floodplain land use disagreements. Convened in 2010 and continuing today is the Snohomish County **Sustainable Lands Strategy**, a forum for divergent interests to cooperate and pursue net gains overall through collaborative planning and integrated floodplain management pursuits. Snohomish County further reinforced local commitment to Puget Sound health with the County Executive and Council launching the **Puget Sound Initiative** in 2016. This initiative expands efforts to protect and restore Puget Sound through county operations and policy changes, and engaging the involvement of residents in behavior changes.

Connectivity to nature enriches our lives. Water access, wildlife viewing and walking improves our health and wellbeing.





Silt Curtain at Union Slough breach



Starter channel breach with incoming tide



Juvenile Chinook

Construction Safeguards

Water quality, fish protection, contaminated soils, and invasive species were the top environmental needs requiring safeguarding during both phases of project construction.

Prior to construction in Phase 2, crews removed all manmade debris from the site, including hundreds of tires, concrete, fencing, steel pipes and tide gates. During construction, water quality best management practices included using non-petroleum, vegetable-based hydraulic fluids with all equipment working in or near the water, spill kits and secondary fuel containment located close to in-water work zones, excavation work in or near the water timed around incoming tides, use of a silt fence, turbidity curtains, and other erosion and sediment controls; and testing water turbidity for permit compliance. Fish screens were employed and staff carefully removed fish from the work area prior to breaching the old dike.

Invasive species of concern were New Zealand Mud Snails, Scotch Broom and Japanese knotweed. Truck wash stations and boot washing protocols were implemented to mitigate Mud Snail escapement. Knotweed was buried below a specified elevation in the tidally inundated area, and post-breach monitoring indicates the saltwater exposure has inhibited its return.



Fish Exclusion

Community Relations

Building Support Takes Time

Nearly a decade before construction began on Smith Island, Snohomish County Public Works planned two community events, beginning with a State Environmental Policy Act (SEPA) review and public meeting in April of 2009. This was followed in July 2009 by a public open house event to outline project objectives, benefits, and to gain public feedback. Mailings and a project webpage were launched prior to the events and consistently updated.

From the beginning, the county recognized that the stakeholder and public engagement process was going to be complex and politically challenging. Balancing agricultural and environmental interests was important. Local business interests, including a nursery, lumber mill and marina, also needed reassurances that operations could continue without long-term disruptions.

As a result, the county developed a five-year Environmental Impact Statement (EIS) in 2013 with public comment periods at each stage of the project's planning and design phase.

The EIS analyzed the benefit of recovering endangered fish species while also addressing concerns over lost farming opportunities. It also established the legality of using agriculture lands for habitat restoration. Gaining public support, specifically from members of local Diking Improvement District No. 5 (District), was key to moving forward.

In response to concerns by the District, the county conducted additional studies to address drainage issues, saltwater intrusion on adjacent farmlands, and tidal slough hydraulics. Meetings were held between the county, the District and their consultant to review technical comments and questions.

Also in 2013, the county released several electronic newsletters, updated the project webpage and conducted meetings and boat tours for stakeholders, including U.S. Congressman Rick Larsen. Any remaining concerns of the District were addressed in a formal inter-local agreement in July 2014, which allowed the project to proceed into design and precluded legal challenges to the project.

The agreement included a 20-year warranty on the setback dike, channel maintenance (dredging) if needed, and mitigation for potential impacts to the District's downstream levees.



Snohomish County Executive Dave Somers (shown) has been a leading advocate for Snohomish River Estuary restoration, garnering public and council support to devote county funding and staff resources to protection and restoration projects and partnerships



Electronic newsletter

“When we come together to restore salmon, we're really investing in the long-term health of our waters, forests, shorelines and the communities that depend on them.”

Kaleen Cottingham, Director
WA Recreation and Conservation
Office



Restoration Celebration



Restoration Celebration brochure

Celebrating Collaboration and Completion

The county has continued outreach with website updates, media stories and social media posts. County partners multiplied and amplified communications efforts through their own channels. As the project neared completion, stakeholders and funding partners were invited to celebrate important milestones.

- Stakeholders, funders and members of the media witnessed tidal waters flow into the area for the first time in 85 years during Breach Observation day on August 10, 2018.
- Approximately 95 people, including regional TV station King 5 News and elected officials, attended the Restoration Celebration on October 2, 2018.

Press coverage of the project was overwhelmingly positive and included 26 stories. Since 2018, the county and its partners shared 18 social media posts celebrating project progress and milestones as well as keeping these estuary restoration efforts top of mind to stakeholders, partners and the public.

The county's ability to engage with the various stakeholders and partners has helped set a precedent and gain public support that will benefit similar projects in the future.

Smith Island interpretive signage

Unusual Accomplishments

Lessons in Wetland Work

The historical marsh plane presented challenges for traditional heavy equipment maneuvering in sodden soils and limited by tide schedules and river flows. Learning from Smith Island, the county has begun experimenting with the use of amphibious excavators, which proved a great success with restoration at a site adjacent to Smith Island.

Funding

Lessons for success with large-scale salmon habitat restoration in an urban landscape may be gleaned from the county's partnership with Washington State Recreation and Conservation Office (RCO) under grant 09-1279. This \$16.4 million agreement is concluding after 10-years; having funded 65% of project design through construction costs. Following are some project lessons from this relationship.

- RCO managed ten individual state and federal program grant contracts under agreement 09-1279; the largest contract administered by RCO to date. Having state-level administrative leadership bolstered county staff capacity in meaningful ways by:
 1. Streamlining grant billing and reporting requirements; Coordinating complex grant match requirements; and
 2. Communicating sponsor needs across multiple funding programs and agencies, and coordinating regional intervention, when needed.
- RCO diligent financial management safeguarded state and federal funder interests while supporting county efforts to successfully comingle compensatory mitigation and grant resources to fully fund site restoration. Snohomish County entered into mitigation agreements with NW Pipeline Corporation, Burlington Northern Santa Fe Railroad (BNSF), and Washington Department of Transportation (WSDOT). Together, these agreements contributed 34 acres of land and \$2.5 million toward design and construction.

Partnerships

The sheer number of partners for the Smith Island project was unusual and also a key factor in the successful implementation. The county had support and funding from more than a dozen organizations. The project symbolized the sustained commitment of this dynamic community.



Conventional excavator stuck in the muck



Amphibious excavator rides high on the tide

Partnerships

“Restoring Smith Island and other strategic areas in the Snohomish River estuary to tidal marsh is critical to seeing positive changes in Chinook and other salmon populations essential to the cultural and economic wellbeing of the Tulalip Tribes.”

Ray Fryberg, Executive Director -
Tulalip Tribes Natural & Cultural
Resources

The Smith Island Estuary Restoration project represents a regionally significant partnership. This project is part of a multi-agency effort to restore the Snohomish Basin Estuary – involving federal, state, county, tribal, city, and port agencies. Complex estuary restoration projects like Smith Island would not be possible without the vision and generous support of regional decision makers and funders.

Partners included:

- Burlington-Northern Santa Fe Railroad
- City of Everett
- Diking Improvement District 5
- National Oceanic and Atmospheric Administration Restoration Center
- Port of Everett
- Puget Sound Energy
- Puget Sound Partnership
- Tulalip Tribes
- United States Army Corps of Engineers
- United States Fish and Wildlife Service (USFWS)
- Washington State Department of Fish and Wildlife (WDFW)
- Washington State Department of Natural Resources (DNR)
- Washington State Department of Ecology
- Washington State Department of Transportation (WSDOT)
- Washington State Recreation and Conservation Office (RCO)
- Williams Northwest Pipeline

Funders:



Additional Accomplishments

A Win, Win

The Smith Island Restoration Project protected the economic interests of various groups, but it took time to convince all parties that was the case. After working with over a dozen partners and reaching an inter-local agreement with the local diking district, the project garnered the public support needed.

Overcoming an unexpected labor strike during the final phase of construction gave even more reason to celebrate completion. The project is a true testament to the value of team work. Thanks to the cooperative efforts of all involved, the environmental and economic benefits are now being realized across the region.

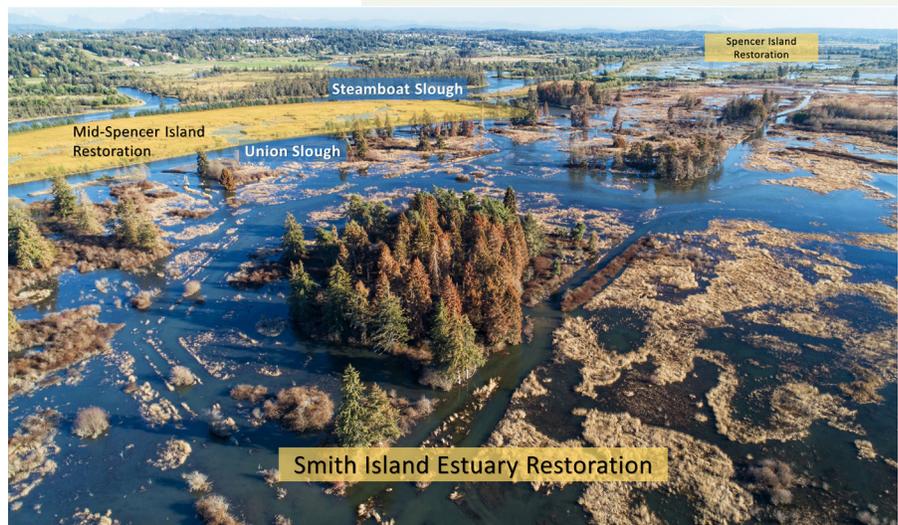
This project improved flood protection for Interstate-5, surrounding infrastructure and private businesses. Costs for this project were shared across local, federal, state and other sources. Snohomish County funded 20% of the overall project cost, state and federal grants funded 70%, and the balance was funded by mitigation agreements and cost-sharing with the City of Everett.

The setback dike is designed to the highest standards, and engineered for long-lasting performance and low maintenance costs. By reducing levee maintenance needs in future, it provides significant benefits to the Diking Improvement District 5 (DID5) and City of Everett.

Project design and construction created many jobs that directly and indirectly stimulate the local economy. Over the longer term, this habitat restoration will help support the return of more salmon, which has a positive economic impact and adds cultural value. Outcomes of this restoration project are expected to include security for commercial fishing jobs and tribal fishing rights, and increased opportunities for sport fishing and other recreation that attract added revenue. Careful, long-term planning is required to meet our development and agricultural production needs while safeguarding the health and productivity of natural resources we depend on.

“With projects like this, we envision a day when there will be plenty of salmon not only for endangered orcas but also for the Tribal, commercial, and recreational fishers suffering from declining salmon numbers.”

Jennifer Steger, NOAA's
Restoration Center



More than 1,332 of tidal marsh have been restored in the Snohomish estuary, more than anywhere else in Puget Sound